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| **TOPIC: Problem Solving** | | | Semester Course |
| **Enduring Understanding:** The purpose of mathematics is to solve problems. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 5: Structure and Logic**  **Concept 2: Logic, Reasoning, Problem Solving, and Proof** | **PO 1*. Analyze a problem situation, determine the question(s) to be answered, organize given information, determine how to represent the problem, and identify implicit and explicit assumptions that have been made.*** | **N** | 1.2 |
| **PO 2. *Solve problems by using theorems, formulating one or more strategies applying the strategies verifying the solution(s), and communicating the reasoning used to obtain the solution(s).*** | **N** | 1.1 |
| **PO 3. *Evaluate a solution for reasonableness and interpret the meaning of the solution in the context of the original problem.*** | **E** | 1.1, 1.2, 1.3, 1.4 |
| **PO 6. *Synthesize mathematical information from multiple sources to draw a conclusion, make inferences based on mathematical information, evaluate the conclusions of others, analyze a mathematical argument, and recognize flaws or gaps in reasoning.*** | **N** | 1.3 |
| **PO 9.** Use mathematical models to represent and analyze personal and professional situations. | **E** | 1.4 |
| Additional Topics that need to be covered | Explore the history of number systems. | **E** | 4.1, 4.2 (optional) |

TOPIC:

**Problem Solving**

**Key Concepts: Key Vocabulary:**

Use inductive reasoning and pattern recognition in problem solving.

Inductive Reasoning

Deductive Reasoning

Counterexample

Number Sequence

Arithmetic Sequence

Geometric Sequence

Explain why progressing from tallying to simple grouping would be an improvement of the numeration system.

Discuss one example of inductive reasoning that you have used recently in your life. Test your premises and your conjecture. Did your conclusion ultimately prove to be true or false?

**Examples:**

**Essential Question(s):**

When is inductive vs. deductive reasoning appropriate?

Compare/contrast the ancient number systems to the current.

**Enduring Understanding:**

The purpose of mathematics is to solve problems.

Ancient number systems effected the development of our current number system.

Choose an appropriate problem solving technique for any given situation.

Positional Numeration

Numeration System

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| **TOPIC: The Basic Concepts of Set Theory** | | | Semester Course |
| **Enduring Understanding:** Sets are a group of information that are related in some way set theory deals with the relation between sets. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
|  | Distinguish between a subset and a proper subset | **E** | 2.1, 2.2 |
| Use Venn diagrams to solve applied problems involving the union, intersection, and complement of sets. | **E** | 2.3, 2.4 |
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**Key Concepts: Key Vocabulary:**

**Enduring Understanding:**

Sets are a group of information that are related in some way set theory deals with the relation between sets.

The intersection of sets is the set of all elements contained in both sets.

Union ()

Intersection ()

Complement (A’)

Empty Set (Ө)

Null Set

Universal Set

Proper Set

Venn Diagram

TOPIC:

**The Basic Concepts of Set Theory**

The union of sets is the set of all elements in either set.

**Essential Question(s):**

How does the union and intersection of sets show the relationship between sets?

Set builder notation is used to express collections of numbers and objects.

**Examples:**

The intersection of a finite and infinite set is a finite set.

Find the indicated union or intersection given the sets.

A = {x|3<x<5}

B = {x|-2<x<6}

C = {x|-<x<0}

D = {3, 6, 7}

1. A C b) A B  C

c) A  D d) A D

e) A’ f) B  D

g) C  D

Place the elements of the sets in a Venn Diagram

U = {m, n, o, p, q, r, s, t, u, v, w}

A = {m, n, p, q, r, t}

B = {m, o, p, q, s, u}

C = {m, o, p, r, s, t, u, v}

The union of a finite and infinite set is an infinite set.

Set is a collection of elements.

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| **TOPIC: Introduction to Logic** | | | Semester Course |
| **Enduring Understanding:** Logic is used daily to decipher and understand real world situations. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 5: Structure and Logic**  **Concept 1: Algorithms and Algorithmic Thinking** | **PO 1. *Use a variety of approaches (inductive and deductive reasoning, estimations, generalizations, formal and informal methods of proof) to analyze algorithms.*** | **N** | 3.1, 3.2, 3.3, 3.4 |
| **Concept 2: Logic, Reasoning, Problem Solving, and Proof** | **PO 8. *Use inductive and deductive reasoning to make, analyze, and validate or refute conjectures and/or proofs.*** | **E** | 3.1, 3.2, 3.3, 3.4 |
| Additional Topics that need to be covered | Statements and Quantifiers | **E** | 3.1 |
| Truth Tables and Equivalent Statements | **E** | 3.2 |
| The Conditional and Circuits | **I** | 3.3 |
| More on the Conditional | **N** | 3.4 |

**Key Concepts: Key Vocabulary:**

TOPIC:

**Introduction to Logic**

inverse

converse

Truth tables are used to determine if statements are logically equivalent.

contrapositive

**Enduring Understanding:**

Logic is used daily to decipher and understand real world situations.

implication

Symbolic logic is used to express logical statements.

tautology

**Essential Question(s):**

How do you determine the validity of an argument or a conclusion?

Why is it important to use logical reasoning?

What is a counterexample used for?

How do you decide if statements are logically equivalent?

contradiction

Truth tables are used to determine the truth value of a compound statement for specific cases.

biconditional

conditional statement

Truth tables are used to determine the validity of an argument.

logically equivalent

**Use the information in the circle graphs to determine the true value of the statement:**

It is not true that freshmen make up 23% of the undergraduate college population and account for more than one-third of the undergraduate deaths, or seniors do not account for 30% of the undergraduate deaths.

**Translate the argument into symbolic form, then determine whether the argument is valid or invalid using a truth table.**

If it is cold, my motorcycle will not start. My motorcycle started. Therefore, it is not cold.

**Construct a truth table for:**

a) 

b) 





negation

Truth tables can be used to determine the truth value of converses, inverses, contrapositive, and bi-conditional.

~ and  are used interchangeably to mean “not”

**Examples:**

**Show that and  are equivalent.**

Solution.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **p** | **q** | **~q** | **p~q** | **~p** | **~p~q** |
| T | T | F | T | F | T |
| T | F | T | T | F | T |
| F | T | F | F | T | F |
| F | F | T | T | T | T |

Corresponding truth values

are the same.

**Use a truth table to determine which statement is not equivalent.**

Jose is blushing or sunburn.

1. If Jose is blushing, then he is not sunburned.
2. Jose is sunburned or blushing.
3. If Jose is not blushing, then he is sunburned.
4. If Jose is not sunburned, then he is blushing.

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| **TOPIC: Geometry** | | | Semester Course |
| **Enduring Understanding:** A knowledge of solids is fundamental to our understanding of the physical world. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 4: Geometry and Measurement**  **Concept 1: Geometric Properties** | **PO 1.** Perform basic geometric constructions using a variety of methods, including, perpendicular bisector of a line segment, bisector of an angle, and perpendicular or parallel lines. | **N** | 9.2 ext |
| **PO 2.** Explore geometries other than Euclidean geometry in which the parallel postulate is not true. | **E** | 9.7 (Supplement) |
| **Strand 4: Geometry and Measurement**  **Concept 4: Measurement** | **HS PO 5.**Calculate the surface area and volume of 3 – dimensional figures and solve for missing measures. | **E** | 9.3, 9.5 |
| **HS PO 4.** Solve problems involving similar figures using ratios and proportions. | **E** | 9.4 |

**Key Concepts: Key Vocabulary:**

Use surface area and volume of solids.

**Examples:**

**Essential Question(s):**

How do you determine which formula to use with a given solid?

How does changing a dimension affect the volume?

**Enduring Understanding:**

A knowledge of solids is fundamental to our understanding of the physical world.

Surface area

Volume

Geometric Construction

Non – Euclidean

Postulates

Axioms

TOPIC:

**Geometry**

If the radius of a cylinder triples, what is the net effect on the surface area and volume?

Construct

\*perpendicular bisectors

\*angle bisectors

\*angles

Geometry changes if parallel lines do not exist.

Use a straightedge and compass to construct geometric figures.

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| **TOPIC: Counting Method** | | | Semester Course |
| **Enduring Understanding:** Counting Methods help us to make decisions and determine probabilities. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 2: Data, Probability, and Discrete Mathematics**  **Concept 3: Systematic Listing and Counting** | **HS PO1.** Apply the addition and multiplication principles of counting, representing these principles algebraically using factorial notation | **E** | 11.1, 11.2 |
| **HS PO2.** Apply appropriate means of computing the number of possible arrangements of items using permutations where order matters, and combinations where order does not matter. | **E** | 11.2, 11.3 |
| **HS PO3.** Determine the number of possible outcomes of an event. | **E** | 11.1, 11.5 |

**Key Concepts: Key Vocabulary:**

Charts, tree diagrams, and other counting principles can be used to determine the number of possibilities available for an event.

**Examples:**

**Essential Question(s):**

How many ways can elements in a set be arranged?

**Enduring Understanding:**

Counting Methods help us to make decisions and determine probabilities.

Permutations and combinations can be used to determine the number of possibilities available for an event.

Tree Diagram

Factorial

Permutation

Combination

Complement (A’)

Disjoint

TOPIC:

**Counting Methods**

Construct a tree diagram of possible ways three coins is tossed and list the ways of getting at least two heads.

Calculate.

1. 
2. 

In how many different ways could 3 distinct days of the week be chosen so at least 1 of them begins with S?

First and second place are to be awarded to 2 different people. If there are 10 candidates, how many outcomes are possible?

|  |  |  |  |
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| **TOPIC: Probability** | | | Semester Course |
| **Enduring Understanding:** Probability and statistics help us make decisions and predict future outcomes. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 2: Data Analysis, Probability and Discrete Mathematics**  **Concept 2: Probability** | **PO 1. *Apply probability concepts to calculate the probability of events and to make informed decisions in practical situations.*** | **E** | 12.1, 12.2, 12.3, 12.4, 12.5 |
| **PO 3. *Estimate probabilities and predict outcomes using one- and two-variable data.*** | **I** | 12.1, 12.2, 12.3 |
| **PO 4. *Determine the conditional probability of an event given that another event occurs, decide if two events are dependent or independent, and determine the probability of an even given the probability of the complementary event.*** | **E** | 12.1, 12.2, 12.3, 12.5 |
| Calculate the probability in binomial situations. | **I** | 12.4, 12.5 |
| Calculate the expected value in different situations. | **N** | 12.5 |
|  |  |  |

**Key Concepts: Key Vocabulary:**

Sample Space

Probability is the measure of how likely an event is to occur.

TOPIC:

**Probability**

Outcomes

Odds

**Enduring Understanding:**

Probability and statistics help us make decisions and predict future outcomes.

In a Florida lottery game, each player chooses six numbers from 1 – 53. If the six numbers chosen matches the six numbers drawn randomly, the player winds the prize. What is the probability of winning the prize? Suppose a person buys 5000 tickets, what is the probability of winning the prize?

Mutually Exclusive

Independent Event

**Essential Question(s):**

How is probability used to make predictions?

How can the probability of an event or events be determined?

How many ways can elements in a set be arranged?

Dependent Event

Conditional Probability

If a family has three children, write the sample space of the children. Find the probability of:

1. exactly one female
2. at least one male
3. four males
4. fewer than four females
5. exactly two females

Binomial Probability

**Examples:**

Expected Value

Two coins are tossed.

1. Find the sample space.
2. Find the probability of heads on one coin.

Using a standard deck of cards, find the probability of picking an ace of hearts.

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| **Car Accidents** | | | |
|  | Wore seat belt | No seat belt | Total |
| Driver Suspended | 412,368 | 162,527 | 574,895 |
| Drive Died | 510 | 1601 | 2111 |
| Total | 412,878 | 164,128 | 577,006 |

1. P(survived / wore a seat belt)
2. P(not wearing a seat belt / did not survive)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of People Living in US alone,**  **in millions** | | | | | | | |
|  | Age 15-24 | Age 25-34 | Age 35-44 | Age 36-54 | Age 55-64 | Age > 75 | Total |
| Male | 0.7 | 2.6 | 4.3 | 1.3 | 1.4 | 1.4 | 12.5 |
| Female | 0.8 | 1.6 | 5.0 | 2.9 | 4.9 | 4.9 | 16.8 |
| Total | 3.8 | 4.2 | 9.3 | 4.2 | 6.3 | 6.3 | 29.3 |

Find the probability, expressed as a decimal rounded to the nearest hundredth that a randomly selected American living alone is:

a) male

b) female

c) in 25-34 age range

d) woman in 15-24 age range

e) man in 45-64 age range

f) not in age group > 65

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| **TOPIC: Statistics** | | | Semester Course | |
| **Enduring Understanding:** Collecting, organizing, summarizing, presenting data and drawing conclusions from the data are essential for understanding statistics. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 2: Data Analysis, Probability and Discrete Mathematics**  **Concept 1: Data Analysis (Statistics)** | **PO1.** Solve problems by estimating and computing with one-variable and two-variable data | **N** | 13.2 |
| **PO2*. Compare data sets using graphs and summary statistics, including variance and standard deviation, with or without technology.*** | **E** | 13.1, 13.3 |
| **PO3.** Compute and explain summary statistics for distributions of data including measures of center and spread, including variance and standard deviation. | **E** | 13.2, 13.4 |
| **PO6.** Explain the differences between randomized experiments and observational studies; and determine the appropriateness of using each in given situations. | **I** | 13.5 |
|  |  |  |  |

**Key Concepts: Key Vocabulary:**

**Examples:**

**Essential Question(s):**

In what way can I most clearly present the gathered information?

How can this information be used to predict future outcomes?

**Enduring Understanding:**

Collecting, organizing, summarizing, presenting data and drawing conclusions from the data is essential for understanding statistics.

Statistics can be used in society to make informed decisions.

There are many ways to represent data.

Data is interpreted in order to make a conjecture.

Descriptive Statistics

Inferential Statistics

Range

Standard Deviation

Mean

Median

Mode

Standard Normal Curve

TOPIC:

**Statistics**

Find the area under the normal curve of a set of information.

Find the quartiles from the data and describe what that means.

Find the range and standard deviation of a list of numbers.

Find the mean, median mode of a list of data.

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| **TOPIC: Personal Financial Management** | | | Semester Course |
| **Enduring Understanding:** Understand the value of money after processing interest, inflation, APR, fixed and adjustable mortgages, taxes, insurance, stocks, bonds, and mutual funds. | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | **Resources**  Ch=Chapter  L=Lesson |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 4: Analysis of Change** | **PO 5.** Solve problems involving compound interest | **E** | 14.1, 14.1 ext |
| **PO 6.** Demonstrate the relationship between: simple interest and linear growth and compound interest and exponential growth. | **I** | 14.1, 14.4 |
| **PO 7.** Determine the total cost of purchasing consumer durables over tine given different down payments, financing options, and fees. | **E** | 14.3, 14.5 |
| **PO 9.** Develop a personal budget including debit, checking, and savings accounts by interpreting multiple personal budget examples. | **N** | Supplement |
| **PO 10.** Determine an effective retirement savings plan to meet personal financial goals including IRA’s, ROTH accounts, and annuities. | **N** | 14.1 |
| Additional Topics that need to be covered | Understand the effect of interest on installment buying. | **I** | 14.2 |
| Understand the calculation of APR as defined in the Truth In Lending Act | **I** | 14.3 |
| Determine whether buying or renting is appropriate based on different situations. | **N** | Collaborative Investigation  (end of Ch. 14) |

**Key Concepts: Key Vocabulary:**

Fixed-Rate Mortgages

Adjustable-Rate Mortgages

Taxes

Insurance

Stock

Bond

Mutual Fund

Amortization

Annual Yield

Inflation

Annual Percentage Rate

Simple Interest

Compound Interest

The type of mortgage and interest rate and insurance will affect your financial health.

The growth of your money is affected by how you invest in stocks, bonds, and mutual funds.

Inflation and taxes affect your spending power and savings.

TOPIC:

**Personal Financial Management**

**Enduring Understanding:**

Understand the value of money after processing interest, inflation, APR, fixed and adjustable mortgages, taxes, insurance, stocks, bonds, and mutual funds.

**Essential Question(s):**

What will happen to your money if you invest in a bank, mutual fund, stocks, bonds, and property?

How does changing one variable affect the others?

**Examples:**

Fill in the first two lines on an amortization schedule.

Find the simple interest for the loan: $1400 at 8% for 1 year.

Reading the stock report, find the cost and closing cost price.